

Spot Safety Project Evaluation

Order # 41000006779

Spot Safety Project # 02-02-239

**Spot Safety Project Evaluation of the Construction of a Directional Crossover at the
Intersection of US 70 and SR 1149 (Sam Garner)
Carteret County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator



Brad Robinson, PE

8/13/2010

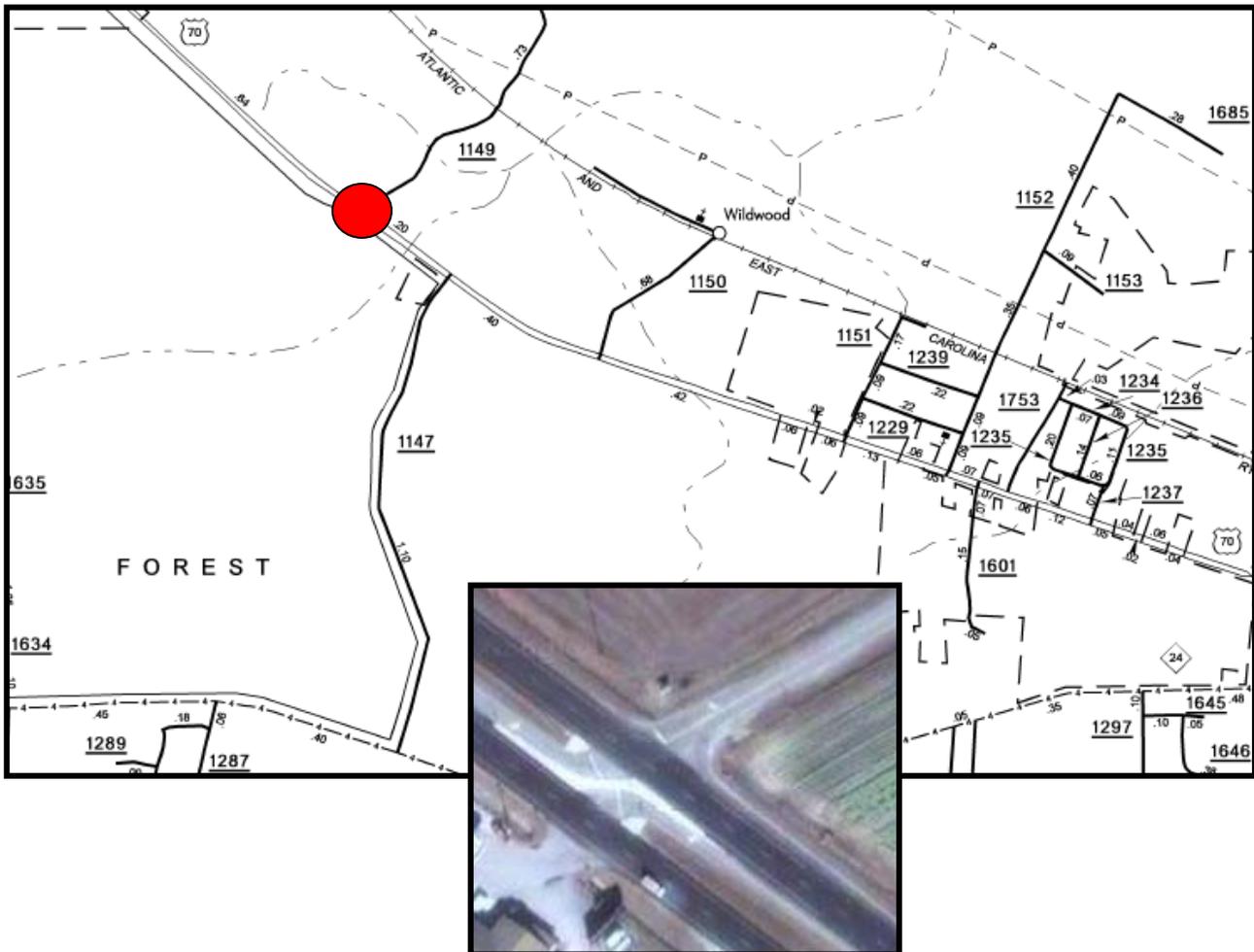
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 02-02-239 – US 70 and SR 1149 (Sam Garner Rd) in Carteret County.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of directional leftovers on US 70 in place of an existing full-movement crossover.

The subject intersection is a four leg intersection with the southern leg serving as an entrance into a PVA. US 70 is a four-lane divided facility with left turn lanes in both directions and a westbound right turn lane onto SR 1149. SR 1149 is a two-lane roadway that tees into US 70 from the north.

The original statement of problem was that motorists entering the intersection from either SR 1149 or from the PVA were experiencing numerous crashes.

The initial crash analysis was conducted from November 1, 1998 to October 31, 2001 with a total of 26 crashes, 24 of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject location was on March 30, 2005 with a total cost of \$150,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from August 1, 2003 to November 30, 2003. The before period consisted of reported crashes from March 1, 1997 through July 31, 2003 (6 years and 5 months) and the after period consisted of reported crashes from December 1, 2003 through April 30, 2010 (6 years and 5 months). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes resulting from vehicles entering the intersection from either SR 1149 or from the PVA are the Target Crashes for the applied countermeasure. These crash types considered are as follows: Left Turn, same roadway; Left Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	48	20	-58.3
Total Severity Index	9.9	11.54	16.6
Target Crashes	43	0	-100.0
Target Crash Severity Index	8.83	0	-100.0
Volume	29,000	29,000	0.0
<u>Target Crash Severity Summary</u>			
Fatal Crashes	0	0	N/A
Class A Crashes	2	0	-100.0
Class B Crashes	8	0	-100.0
Class C Crashes	17	0	-100.0
PDO Crashes	16	0	-100.0

The naive before and after analysis at the treatment location resulted in a 58 percent decrease in Total Crashes, a 100 percent decrease in Target Crashes, and no change in Average Daily Traffic (ADT). The before period ADT year was 2002 and the after period ADT year was 2007.

Results and Discussion

The installation of the median leftovers was very effective at reducing Target Crashes at the subject location. In the before period there were 43 Frontal Impact Crashes resulting from vehicles attempting to cross the intersection from the side roads, with the majority of the crashes (36 crashes) involving vehicles entering from SR 1149. There were no Target Crashes in the after period.

A previously non-existent crash pattern emerged in the after period between vehicles turning right from SR 1149 and vehicles traveling westbound US 70. There were nine crashes of this type in the after period.

There was a non-target Fatal Crash in the after period involving a pedestrian attempting to cross the road. The crash occurred at night when a pedestrian was crossing the westbound leg of US 70.

The calculated benefit to cost ratio for this project is 10.12 considering total crashes. The benefit to cost ratio considering only target crashes is 17.72. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

In order to see if there was any crash migration due to the restriction of left turn turns from the side streets, a quick crash analysis was conducted at the crossovers on each side of the subject intersection. The closest crossover to the west is approximately 1500 feet from the subject location. The only crash that occurred in the vicinity of this crossover that appears possibly related to the project is a fixed object crash that occurred due to an eastbound vehicle running off the road in order to avoid a westbound vehicle making a u-turn. This crash occurred in 2006 and did not result in an injury.

The closest crossover to the east of the subject location is at the intersection of US 70 and SR1147, a distance of approximately 1200 feet from the subject location. The only crash that occurred at this intersection that appears possibly related to the project is a sideswipe crash that occurred on eastbound US 70 just prior to the crossover and involved a vehicle in the outer lane attempting to merge into the inner lane. This crash also occurred in 2006 and did not result in an injury.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of roadway.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 70 and SR 1149
 COUNTY: Carteret
 FILE NO.: SS 02-02-239

BY: bdr
 DATE: 7/28/2010

DETAILED COST: TYPE IMPROVEMENT - Median Left-Overs

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$150,000	20	0.102	\$15,278
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$150,000	20	0.102	\$15,278

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$800
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$16,078
 TOTAL COST OF PROJECT= \$150,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	6.42	3	0.47	27	4.21	18	2.80	\$390,561
AFTER	6.42	2	0.31	8	1.25	10	1.56	\$227,882

Annual Benefits from Crash Cost Savings \$162,679

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$146,601

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 10.12

TOTAL COST OF PROJECT - \$150,000 COMPREHENSIVE B/C RATIO - 10.12

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 70 and SR 1149
 COUNTY: Carteret
 FILE NO.: SS 02-02-239 Target Crashes Only

BY: bdr
 DATE: 7/28/2010

DETAILED COST: TYPE IMPROVEMENT - Median Left-Overs

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
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Right-of-Way	\$150,000	20	0.102	\$15,278
	\$0	0	0.000	\$0
TOTALS	\$150,000	20	0.102	\$15,278

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COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	6.42	2	0.31	25	3.89	16	2.49	\$284,860
AFTER	6.42	0	0.00	0	0.00	0	0.00	\$0

Annual Benefits from Crash Cost Savings \$284,860

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$268,782

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 17.72

TOTAL COST OF PROJECT - \$150,000 COMPREHENSIVE B/C RATIO - 17.72

Treatment Site Photos from Google Street-View



Looking west on US 70



Looking east on US 70



Looking South on SR 1149 (Sam Garner)



Looking at PVA entrance from intersection

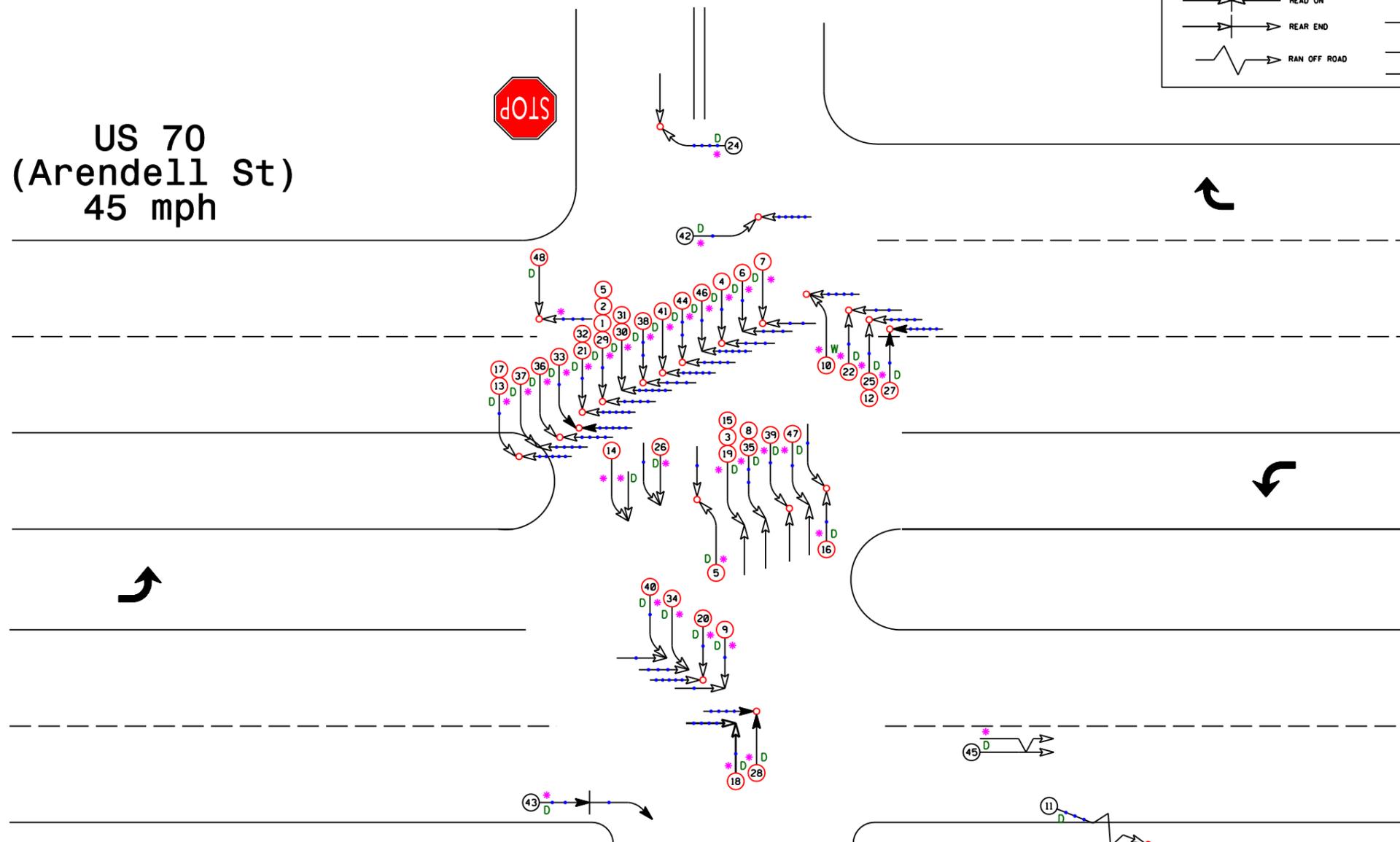
Carteret County
 US 70 (Arendell) at
 SR 1149 (Sam Garner)
 BEFORE Period
 3/1/1997-7/31/2003

SR 1149
 (Sam Garner Rd)

US 70
 (Arendell St)
 45 mph

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		70 AND UP
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		ONLY



⊕
 Target Crash

US 70
 (Arendell St)
 45 mph

PVA

N.C. DEPARTMENT of TRANSPORTATION
 DIVISION of HIGHWAYS
 TRANSPORTATION MOBILITY and
 SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: June 2010 Prepared By: BDR

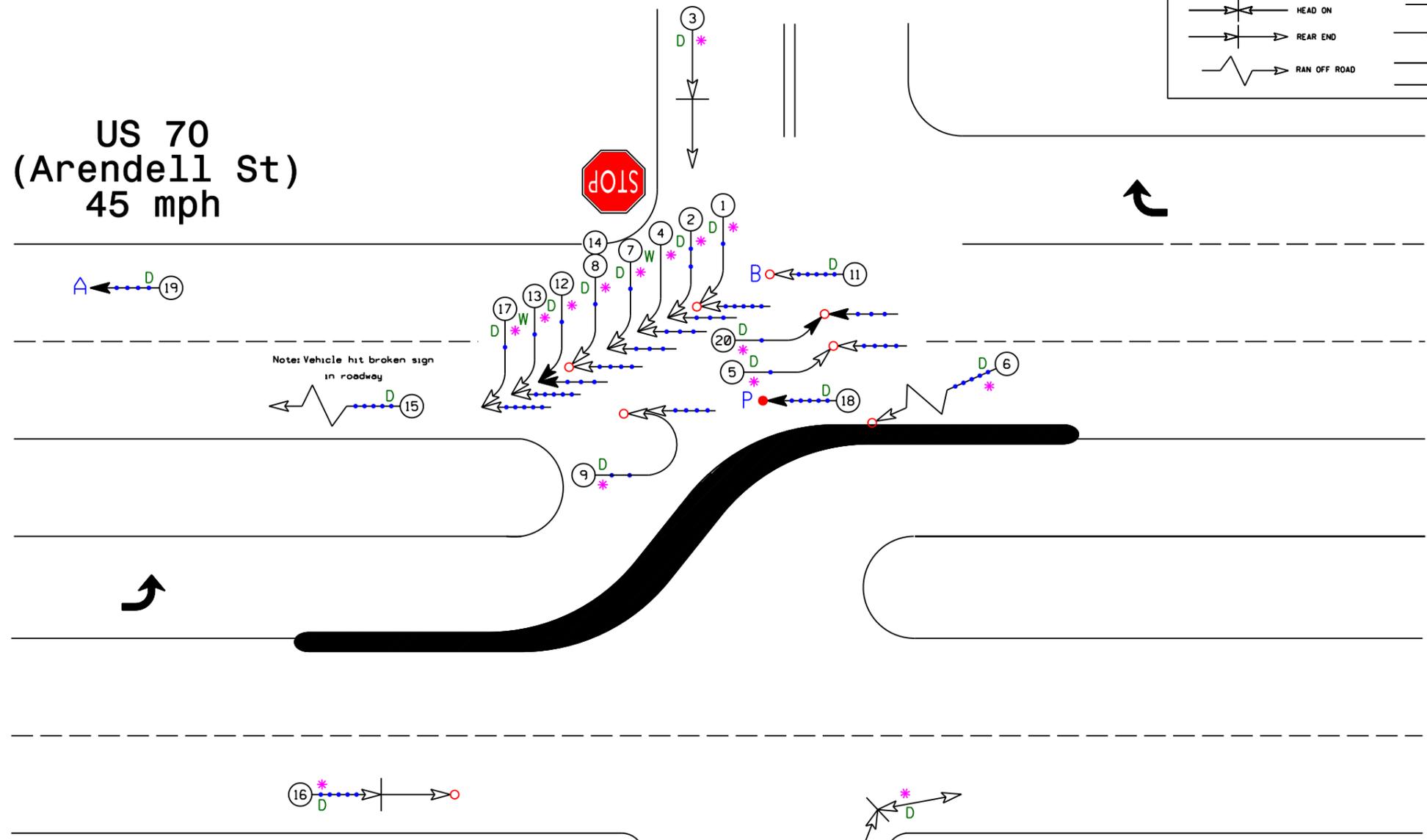
Carteret County
 US 70 (Arendell) at
 SR 1149 (Sam Garner)
 AFTER Period
 12/1/2003-4/30/2010

SR 1149
 (Sam Garner Rd)

US 70
 (Arendell St)
 45 mph

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		T TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		• DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		D DRY
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	REAR END		FATALITY		60 MPH TO 69		— SPEED UNKNOWN
	RAN OFF ROAD				70 AND UP		O ONLY



Target Crash

PVA

US 70
 (Arendell St)
 45 mph

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